SUNSHINE
MINING COMPANY
EUREKA OPERATIONS

P.O. Box 250
EUREKA, UTAH 84628
[801] 433-6854

T.B. HANNIFIN, JR.
General Manager

March 21, 1986

David J. Cline
Utah Division of Oil, Gas & Mining
355 West North Temple
3 Triad Center Suite 350
Salt Lake City, Utah 84180-1203

Dear Mr. Cline:

Re: Peak Flow Values and Plan For Tailings Ponds Area Diversion

Enclosed is a calculation summary which provides you with the required flow values that were used in designing the Trixie pond area diversion canal. Specifically, the work includes channel capacity, flow velocities and stabilization measures that were requested.

Also enclosed is a plan map showing the modified watershed area (yellow line), the hydraulic length (blue line) and a ditch extension into the natural stream channel. A general arrangement of the ponds was added for overall clarification.

As requested, Sunshine Mining Company sampled the soil from each pond site. Three samples were obtained and sent to Ford Chemical Laboratory for the following analysis: conductivity, nitrogen, phosphorus, potassium, and pH. A certificate of analysis for these samples has been enclosed.

We believe that our standard ditch design will suffice for maximum runoff in all cases. Please note, too, that S.M.C. opts to prepare for the 100 yr.24hr. event.

This information should complete what you need to process the permit application. If any questions arise, please call.

Sunshine Mining Company - Eureka Operations has still not received any final information on the bond rider to cover this addition to our permit area. We will contact your office regarding the surety bond when this issue is resolved with our bond company.

We appreciate very much the Division's assistance and the use of your programs for computing some critical values.

Very truly yours,

T. B. Hannifin, Jr.
General Manager

TBH/lrl

Enclosures

Addendum to Permit Application

7.0 Tailings Pond Area Diversion Ditch

7.1 Required

A diversion ditch adequately designed to divert storm runoff from a 44-acre catch basin around the three small ponds proposed for permanent storage of Trixie mine tailings. Ditch design criteria and calculations follow.

7.2 Assumptions, Inputs and Results

Peak values for tailings pond area runoff diversion and references:

CN = 69.6 use 70 (Ref. Orig. Appl.)

Ppt depths, type II storm (Ref. Miller, '73):
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10-yr.   =   1.70 in.
100-yr.  =   2.85 in.
Watershed area   =   44.1 acres (Ref. Map)
Hydraulic Length   =   4270.0 ft. (Ref. Map)
Flows   (Ref. D.O.G.M.):
   Q10   - 24  =   1.85 cfs
   Q100  - 24  =   16.01 cfs
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7.3 Standard Design

Specifications for the standard ditch section proposed for all S.M.C. diversion projects:

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Section - trapezoidal
Bottom Width (b) - 2.75 ft.
Nom. depth of flow (d) - 1.33 ft.
Freeboard - 0.5 ft.
Slopt, 60° (z) - 0.5774
Lining - contingent upon flow velocity in each case.
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7.4 Manning Equation

Equation used to calculate velocity in all diversion ditch segments.

$$V = 1.486 \; R \; 0.67 \; S \; 0.5 \div n, \text{ where}$$

n = surface factor for earth canals

s = slope of channel, ft. ÷ ft.

r = hydraulic radius, or cross-sectional area $(bd + zd^2)$ ÷ wetted perimeter $(b + 2d\sqrt{Z^2 + 1})$

v = velocity, fps

7.5   Critical Ditch Segment

The critical segment diverts all runoff from the catch basin to a point immediately beyond the last pond (Ref. map). Both operational and permanent closure phases of runoff diversion are determined below.

Elevation difference = 5620-5525 = 95 ft.
Channel Length = 9.8 in. X 200 = 1960 ft.
Slope (S) = 95 ÷ 1960 = 0.0485 or 4.85%

Operational phase (10 yr., 24 hr. storm):

Discharge (Q) = 1.85 cfs

Channel - standard, as above

Surface factor (n) = 0.024

Depth (d) = 0.167 ft. (Ref. D.O.G.M. program)

Area (A) = 0.476 sq. ft.

Wetted Perimeter (p) = 3.14 ft., and

Velocity (V) = 3.88 fps

Lining - essentially no lining required at this low velocity

Standard ditch exceeds requirements

Permanent closure phase (100 yr., 24 hr. storm):

Discharge = 16.01 cfs

Channel - standard, as above

Channel factor = 0.024

Depth = 0.627 ft. (Ref. D.O.G.M. program)

Area = 1.952 sq. ft.

Wetted perimeter = 4.198 ft., and

Velocity = 8.203 fps

Lining - a velocity of 8.2 fps requires a ditch riprap mixture of stones to 11 in. in diameter

Standard ditch is adequate for storm runoff plus required riprap.

7.6   Non-Critical Ditch Segment

The non-critical segment connects the critical segment with an original stream channel at a point well below the three small ponds (Ref. map). Only the permanent closure phase is determined below.

Slope = 18 ÷ 338 = 0.533 or 5.33%

Surface factor = 0.030 (Ref. D.O.G.M.)

Permanent closure phase (100 yr., 24 hr. storm):

Discharge = 16.01 cfs

Channel - standard, as above.

Depth = 0.70 ft. (Ref. D.O.G.M. program)

Area = 2.2 sq. ft.

Wetted perimeter = 4.36 ft. and

Velocity = 7.27 fps

Lining - a velocity of 7.3 requires a ditch reprap mixture of stones to 8 in. in diameter

Standard ditch is adequate for storm runoff plus required riprap.

7.7 Phase Selection

Although permitting requirements can be satisfied with the operational phase of storm runoff diversion, S.M.C. opts to construct both ditch segments to comply with permanent closure requirements. The probability of ditch failure is reduced to 5% with this precautionary construction.
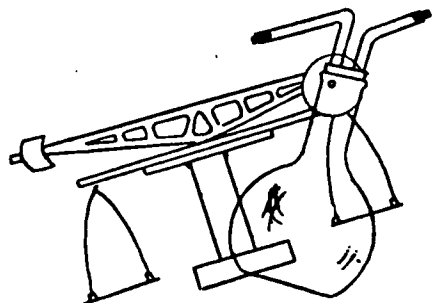
DATE: 02/18/86

CERTIFICATE OF ANALYSIS

SUNSHINE MINING CO.
P.O. BOX 250
EUREKA, UT
 84628

86-003304

SAMPLE: SOIL SAMPLES RECEIVED 1-30-86 FOR ANALYSIS.

	SAMPLE A	SAMPLE B	SAMPLE C
Conductivity mmhos/cm @ 25	.14	.10	.09
Nitrogen as N %	.005	.002	.002
Phosphorus as P %	616.710	607.760	306.540
Potassium as K ppm SM303A	1,798.27	2,223.61	937.64
pH Units (1:1 Ratio) SM423	7.80	7.80	8.15

FORD CHEMICAL LABORATORY, INC.